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Title	A Wearable Fall Detection Device: From Research Advances and Public Datasets to a Senior Design Project
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Abstract

Fall is one of the most serious accidents for elders and the fall might occur at any moment. With the growing aging population, an urgent need for the development of fall detection systems is inevitable. Fall detection and monitoring is an active field of research. This work used available research advances and public datasets as launch pad for a senior-year design project. There are two main goals in this work, to develop a fall detection algorithm and to build a wearable fall detection device. A public dataset was used to test the performance of this thresh-old-based classification. The developed algorithm has 86.95% sensitivity, 96.08% specificity and 90.83% accuracy. The chosen thresholds are later programmed into the embedded hardware. This fall detection device employed ADXL345 accelerometer, ITG3200 gyroscope and ESP8266. All components were fitted into a 3D printed case as a wearable belt buckle. The detector monitors the elder's normal and abnormal movements through the embedded algorithm. In the event of fall, the alarm will turn on, to attract attention and help from people nearby as well as an Internet-based notification message will be sent to family members and/or caregivers through the Wi-Fi connection. In case of a false alarm, this device was equipped with a decision delay, a posture verification and a button to break off the alert.